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RESEARCH ARTICLE

PREVALENCE OF DIARRHOEAL INFECTIONS BASED ON ENVIRONMENTAL CONDITIONS IN CHILDREN 0-3 YEARSIN ANAMBRA STATE:A SURVEY OF FIVE RURAL COMMUNITIES

Bessie Nonyelum Esimai[1], Emmanuel Ifeanyi Obeagu[2], Elizabeth Ukamaka Agunwah[3] and Onyekachi Ogba Okpata[3]

1. Department of Medical Laboratory Science, Evangel University, Akaeze, Ebonyi State, Nigeria.
2. Department of Medical Laboratory Science, Kampala International University, Western Campus, Ishaka, Uganda.
3. Department of Nursing Science, Evangel University, Akaeze, Ebonyi State, Nigeria.

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Abstract

This work was conducted to investigate the most prevalent parasitic infection and conditions that are responsible for diarrhoeal infection in the age range 0 - 3 years. The objective was to note how lack of infrastructural and social amenities could affect the prevalence of diarrhoea in both urban and rural communities in its environs namely Abakpa - Nike, Emene, Ugwuaji - Awkunanaw, Amechi and Agbani were undertaken. The work suggested various control measures aimed at the efficacious containment of diarrhoeal infections in the target population of the 0-3 years olds. A random sampling of a population size of 600 was utilized in the study which comprised of 300 males and 300 females. 300 were chosen from Enugu and 300 from all its environs Environmental conditions of the patients dwelling areas were established by household surveys. For bacteria isolates, E.coli ranked highest with 75 cases (12.5%) followed by Salmonellae 7 (1.2%), Shigellae 4 (0.2%). For Protozoa/helminths, Malaria parasites were highest with 333 (55.5%) followed by Ascaris 73 (12.2%), A.duodenale 39 (6.5%), T. trichiura26(4.3%), E. histolytica 15 (2.5%), and G.lambil13 (2.7%).

***Corresponding Author:-** **Emmanuel Ifeanyi Obeagu**

Introduction:-

Gastroenteritis is the inflammation of the gastrointestinal tract lining, which involves both the stomach (“gastro”) and the intestines (entero) and this results in sudden onset of diarrhoea and vomiting [1]. Gastroenteritis remains a major global problem in children around the world. Children in sub-Saharan Africa are 15 times more prone to death from diarrhoeal diseases before they attain the age of 5 years than children living in countries that are developed [2]. Infection due to gastroenteritis has been known to be caused by microorganisms such as: Salmonella species, Shigella species, Campylobacter species, E. coli O157:H7, Yersinia enterocolitica, Vibrio cholera, Rotavirus, Cryptosporidium species, Entamoebahistolytica,Listeria monocytogenes and Giardia lamblia [1]. Other causes are by ingestion of some food items, chemical toxins or drugs.

A change in bowel habit from normal with an increase in stool volume and/or fluidity resulting in an increase in stool frequency is referred to as diarrhoea. It is also defined as a form of gastrointestinal infection caused by a variety of bacterial, parasitic and viral organisms or via contaminated drinking water, , food or from person-person

as a result of poor hygienic practices. If not untreated, diarrhoea can typically last several days [3].World Health Organization (WHO) regards a disease to be diarrhoea if there is a passage or excretion of watery stools in about two-three times within 24 h period [3]. However, factors such as; stool frequency, stool consistency, and the usefulness of parental discernment in determining whether children have diarrhoea or not is clearly important to ascertain if diarrhoea has occurred or not. Acute diarrhoeal illnesses or dysentery is often easily characterized by bloody appearance of stool, irrespective of frequency or consistency [3].

Diarrhoeal episode is usually divided into acute, persistent and chronic. The most common ofdiarrhoea disorders, acute diarrhoea often begins abruptly, are as a result of infections and are subdue/resolved within 14 days. Persistent diarrhoea arises as a result of secondary infections in the presence of complications like malnutrition while chronic diarrhoea is majorly a product of congenital defects of digestion, absorption in the body system and it lasts for a minimum of 14 days [3]. Among children below the age of 5 years old, diarrhoea- related diseases account for the second highest cause of death [4]. Although the diarrhoea mortality rate has reduced globally, morbidity rate is still high in Sub-Sahara Africa because the region is experiencing increased population growth, practices, lack of proper hygiene conditions and resources for surveillance, diagnosis, treatment and prevention of the disease is scarce in the region [4]**.**

In sub-Saharan Africa, there are more than one billion diarrhoeal cases and an estimated 606,024 deaths of diarrhoea yearly with nearly half of the deaths occurring in children lesser than five years of age [5].In Nigeria, there are an estimated 151,700 yearly child mortality as a result of diarrhoea[6] with the prevalence rate of diarrhoea ranging between 10% and 18.8% [6]and 80,968 deaths as a result of unsafe water and unhygienic sanitation thus making Nigeria one of the leading contributors to diarrhoeal morbidity and mortality worldwide [6].

However, resistance has emerged even to newer, more effective antimicrobial agents [7]. Among the factors leading to increased risk of diarrhoea among children are: failure to adequately breast-feed a child for the first 4-6 months of life. Diarrhoea has been observed to be much greater in non-breastfed than adequately breastfed infants. Susceptibility of host to infection is assessed by the child's age, presence of protective maternal factors (trans-placental antibodies), immunological status, nutritional status, and prior exposure to foreign harmful entities, acquired immunity and genetic susceptibility [7].

Material And Methods:-

Diarrhoeal cases were chosen on the basis of, 'three or more soft or liquid stools within 12 hours or a single soft or liquid stool - containing blood, pus or mucus.

Samples for investigation were collected from Emene, Abakpa-Nike, Ugwuaji-Awkunanaw, Amechi and Agbani from January to May 1988. These months are the peak diarrhoea period. The designated centres for collection were visited repeatedly. Materials collected for analysis include blood and stool samples. All results obtained were compared, with data from hospitals located in Enugu.

Sample population size

A random sample of a population size of 600 was utilized in the study; comprising of 300 males and 300 females (See table 1). There were no problems in collecting samples from the hospitals and clinics in Enugu. It was conveniently carried out with the permission of the Health-workers in charge.

The rural HealthCentres and general hospital of the study areas in the Enugu environs were also visited for collection of samples since it was not easy to get enough cases of diarrhoea in the individual homes in those areas, it was noted that most diarrhoea cases in those areas go to health centres and general hospitals where available, for treatment. Sampling of individuals was done purely on the basis of availability and chance.

Procedure for field work

In the study areas of the rural dwellers, young boys and girls were employed and trained to scan for cases and collect fresh samples. These were made available at specific days and times for mass transportation to appropriate quarters for investigation.

These assistants were also trained to record answers obtained from the interview-administered questionnaires given to illiterate parents, and to distribute, collect and return self-administered questionnaire forms from literate parents.

They co-operated and did the job judiciously. The health workers were incorporated to do the same in most of the health Centres. That made data collection very easy. The village heads in most cases helped in inviting the young boys and girls who were employed for the job, and in enlisting the co-operation of parents and guardians.

A mobile laboratory which consisted of 70% alcohol, lancet, cotton wool slides, empty sterile containers, tapes, bathroom scale and a big padded slide box was quite useful for the field work.

Laboratory Examinations
Examination of samples were carried out in the Department of Parasitology Laboratory, Anambra State University of Technology, Awka Campus.

Sample Collection
Stool and blood samples were collected. Disposable sterile containers were used for collection of stool samples. Samples were collected in such a way as to ensure non contamination with urine, so as to avoid lysis of the trophozoites on contact with water. It was noted if the child had been on antibiotics or antidiarrhoeal compounds containing kaolin, pectin, bismuth or magnesium hydroxide, as these could also suppress the growth of the micro-organisms. The diarrhoea cases wore chosen on the basis of, 'Three or more soft or liquid stools within 12 hours or a single soft or liquid stool-containing blood, pus or mucus.'

Blood samples were taken from patients with violent vomiting to screen for presence of malaria parasites. These were collected by ear-lobe or finger pricking technique using Lancet. Thick films were usually made immediately on the microscopic slides, allowed to dry.

All the samples were clearly labeled and packed for transportation. They were preserved in the refrigerator at 4ºC if the tests were not carried out 2 hours after collection.

After each sample collecting session, a group talk was given to the mothers (especially in the rural areas) by way of advice on oral rehydration therapy (ORT) as shown in the plates of the appendix 2 and also enlightened them on ways of protecting their babies against diarrhoea. The talk was usually delivered in the native language for better comprehension.

MicrOscopic Examination
Macroscopic examination of stool samples gave useful information. In profuse watery stools (rice water stool) sometimes flecked with mucus, enteropathogenicE. Coliwas suspected.

Lesser quantities of soft stool containing blood and mucus was suspected of amoebiasis bacillary dysentery, shigellosis or campylobacter infections.

Microscopic Examinations of stool samples
A small portion of stool samples was mixed with a drop of saline on a microscopic slide and examined for the presence of trophozoites of E.histolytica and Giardialamblia. Wet mounts of lugol's iodine or eosin mixed with saline were also examined microscopically for cysts and ova

Bacteriological Examinations
Loopfuls of each specimen of stool were directly inoculatedontodeoxycholate citrate agar, plates and into tubes of selenite F. The stools were emulsified in tubes of peptone water before MacConkey agar plates and blood agar plates were inoculated; all were incubated at 37ºC for 24 hours. The following day the plates were examined for non-lactose fermenting colonies. The selenite F cultures were plated out onto MacConkey plates and incubated at 37ºC overnight. Non-lactose fermenting colonies were identified. Blood agar culture plates were used for serological identifications.

Examination of Blood Samples for the presence of malaria parasites
My assistants were trained to make only the thick films. A drop of blood on a microscopic slide, was rotated with a stick to about 2cm in diameter, and allowed to air dry.

Staining was done using one in ten dilution of Giemsa solution for 10 minutes. The water content of the solution lyses the red blood cells exposing the parasites.

The presence of malaria parasites was determined by microscopic examination.

Areas Of Study

The areas of study which include the environs of Enugu, notably Amechi, Ugwuaji-Awkunanaw, Abakpa-Nike, Emene and Agbaniwere chosen for comparative studies on the incidence of diarrhoeal infection.

Results:-

Drug Sensitivity of Bacterial Pathogens

It is noted that septrin and gentamycin were most effective in Inhibition of most of the bacterial strains tested. Pseudomonas aeruginosa strains were resistant to all the drugs except Gentamycin which inhibited 100% of the strains of this organism.

Table 1:- Prevalence Of Causative Agents Of Diarrhoeal Infection According To Environmental Condition And Number Of Isolates From Patients.

CAUSATIVE AGENTS	NO. OF ISOLATES ACCORDING TO ENVIRONMENTAL CONDITIONS					TOTAL PER ISOLATE
	Excellent	Very Good	Good	Poor	Very poor	
1.Escherichia Coli	1	2	9	38	25	75
2.Salmonellae	3	2	2	0	0	7
3.Shigella	0	0	1	2	1	4
4.Ascaris Lumbricoides	8	12	13	15	25	73
5.Ancylostoma duodonale	0	1	8	14	16	39
6. Entamoebahistolytica	2	3	2	3	5	15
7.Trichuris trichiura	0	1	8	8	9	26
8. Giardia lamblia	1	2	2	3	5	13
9. Proteus vulgaris	0	0	0	0	1	1
10.Pseudomonas aeruginosa	0	0	1	1	0	2
11. MalariaParasites	31	54	70	86	92	333
12.Diasaccharidase deficiency	6	11	4	1	1	23

Key; Excellent = 8-9, Very Good = 6 – 7; Good = 4 – 5; Poor = 2 – 3; Very Poor = 0 – 1.

Table 2:- Percentage Incidence Ofisolates Of Causative Agents From Diarrhoeal Patients According To Environmental Conditons.

CAUSATIVE AGENTS	NO. OF ISOLATES ACCORDING TO ENVIRONMENTAL CONDITIONS					TOTAL PER ISOLATE
	Excellent	Very Good	Good	Poor	Very poor	
1.Escherichia Coli	1 (0.2%)	2 (0.3%)	9 (1.5%)	38 (6.2%)	25 (4.1%)	75 (12.3%)
2.Salmonellae	3 (0.5%)	2 (0.3%)	2 (0.3%)	0	0	7 (1.1%)
3.Shigella	0	0	1 (0.2%)	2 (0.3%)	1 (0.25)	4 (0.7%)
4.Ascaris Lumbricoides	8 (1.3%)	12 (2.0%)	13 (2.1%)	15 (2.5%)	25 (4.1%)	73 (12.0%)
5.Ancylostoma duodonale	0	1 (0.2%)	8 (1.3%)	14 (2.3%)	16 (2.6%)	39 (6.4%)
6. Entamoebahistolytica	2 (0.3%)	3 (0.5%)	2 (0.3%)	3 (0.5%)	5 (0.8%)	15 (2.55)
7.Trichuris trichiura	0	1 (0.2%)	8 (1.3%)	8 (1.3%)	9 (1.5%)	26 (4.3%)
8. Giardia lamblia	1 (0.2%)	2 (0.3%)	2 (0.3%)	3 (0.5%)	5 (0.8%)	13 (2.1%)
9. Proteus vulgaris	0	0	0	0	1 (0.2%)	1 (0.2%)
10.Pseudomonas aeruginosa	0	0	1 (0.2%)	1 (0.2%)	0	2 (0.3%)

12. MalariaParasites	31(5.1%)	54 (8.8%)	70 (11.5%)	86 (14.1%)	92 (15.1%)	333 (54.5%)
12.Diasaccharidase deficiency	6 (1.0%)	11 (1.8%)	4 (0.7%)	1 (0.2%)	1 (0.2%)	23 (3.8%)
TOTAL	52 (8.5%)	88 (14.4%)	120 (19.6%)	171 (28.0%)	180 (29.5%)	611 (100%)

Key: Excellent = 8-9 No. of Isolates per condition X 100
Very good = 6-7 Percentage = Total no. of Isolates of
1
Good = 4-5 Causative agents
Good = 4-5
Poor = 2-3
Very Poor = 0-7

Table 2:- Contd: Percentage Incidence Of Isolates Of Causative Agents From Diarrhoeal Patients According To Environmental Conditons.

CAUSATIVE AGENTS	TO ENVIRONMENTAL CONDITIONS (NO. OF ISOLATE FROM)					TOTAL PER ISOLATE
	Excellent	Very Good	Good	Poor	Very poor	
1.Escherichia Coli	1 (1.3%)	2 (2.7%)	9 (12.0%)	38 (50.7%)	25 (33.3%)	75 (100%)
2.Salmonellae	3 (42.9%)	2 (28.6%)	2 (28.6%)	0	0	7 (100%)
3.Shigella	0	0	1 (25.0%)	2 (50.0%)	1 (25.0%)	4 (100%)
4.Ascaris Lumbricoides	8 (11.0%)	12 (16.4%)	13 (17.8%)	15 (20.5%)	25 (34.2%)	73 (100%)
5.Ancylostoma duodonale	0	1 (2.6%)	8 (20.5%)	14 (35.9%)	16 (41.0%)	39 (100%)
6. Entamoebahistolytica	2 (13.3%)	3 (20.0%)	2 (13.35)	3 (20.0%)	5 (33.3%)	15 (100%)
7.Trichuris trichiura	0	1 (3.8%)	8 (30.8%)	8 (30.8%)	9 (34.6%)	26 (100%)
8. Giardia lamblia	1 (7.7%)	2 (15.4%)	2 (15.4%)	3(23.1%)	5 (38.5%)	13 (100%)
9. Proteus vulgaris	0	0	0	0	1 (100.0%)	1 (100%)
10.Pseudomonas aeruginosa	0	0	1 (50.0%)	1 (50.0%)	0	2 (100%)
13. MalariaParasites	31 (9.3%)	54 (16.2%)	70 (21.0%)	86(25.8%)	92 (27.6%)	333 (100%)
12.Diasaccharidase deficiency	6 (26.1%)	11 (47.8%)	4 (17.4%)	1 (4.3%)	1 (4.3%)	23 (100%)
	52 (8.5%)	88 (14.4%)	120 (19.6%)	171 (28.0%)	180 (29.5%)	611 (100%)

Key: Excellent = 8-9 No. of Isolates per condition X 100
Very good = 6-7 Percentage = Total no. of Isolates of each
1
Good = 4-5 Causative agents (e.g. 75)
Good = 4-5
Poor = 2-3
Very Poor = 0-1

Discussion:-

In the urban town of Enugu, it is noted that Escherichia coli is rampant. That could be due to unsanitary condition of the living environment of the people. Unflushed water cistern as seen in plate 3 and bucket system which still prevail in some areas of Obiagu, Uwani, Asata, Udi-siding and Coal camp may be responsible for such transmission of infection by flies or faecalcontamination of food, especially milk formulas and other supplementary food. There is an increasing awareness of Enteropathogenic Escherichia coli scrotypes as a common cause of gastroenteritis and a prime cause of infant diarrhoea[8].

Entamoebahistolytica was incriminated in 15 (2.5%) of diarrhoealcases. This may occupy as a result of faecal contamination of drinking water or water supplies. The causative agents of diarrhoeal infection may be ingested through drinking such contaminated water if it is not boiled and filtered as experienced in most families in the rural andthe urban areas. Vegetative state of Ehistolytica was found not to be much in number in the rural dwellers in relation to the consumption of unboiled and unfiltered contaminated water in those areas. It is envisaged that these trophozoites die in the cause of transportation of faecal samples to the appropriate quarters for investigation.

Generally, 82 (13.7%) of the samples were negative for any causative agents of diarrhoeal infections, while 518 (86.3%) of the samples were positive for causative agents ofdiarrhoeal infections of one type or the other. This may have occurred as a result of self-medication; that is, the children were treated by their parents before sending them to hospitals or clinics. This practice was found prevalent in the urban dwellers of Enugu. 234 (39.0%) of the samples collected from Enugu urban had causative agents while 66 (11.0%) of the samples had no causative agents.

Non isolation of the causative agents may also be due to non-availability of adequate equipment for differential diagnosis in relation to children that have viral infection such as measles.

Salmonellae organisms which were isolated predominantly from the high socio-economic homes and from very good environmental conditions may be attributed to its mode of transmission. This organisms is known to be present in contaminated milk products, and may be contracted from drinking milk products such as yoghourt, ice cream, and canned milk. They are also found in poultry, beef, pork and lamb,Salmonellae typimuriumhappened to be the only serotype isolated, in 7 (1.2%) of the sampled population. This type is confirmed to be widely associated with cases of diarrhoea in many parts of the world according to Agarwal et al.[10] from India, Seligmannet al[9] United states, Kaufmann [11]) noted that S.typhimuriumis responsible for 55-70% of human gastroenteritisinEngland, Denmark and Germany [12,13].

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